

Approval Form for Directed Research in Microbiology

Student's full printed name _____ Course #: MIBO _____

Semester and year for which student will be working in lab: _____

Title of Project _____

STUDENTS ARE EXPECTED TO WORK A MINIMUM OF 12 HOURS PER WEEK AND PRODUCE A PAPER. INSTRUCTIONS FOR WRITING THE PAPER ARE ATTACHED. Papers should be electronically submitted by 5:00 pm on the LAST DAY OF CLASS of the semester indicated on the research form to Kim Brown khbrown@uga.edu. **If a student does not meet this deadline their grade will be lowered by 25%.**

Faculty mentor's signature _____

Printed Name _____

Email _____

Dept. of _____ BLDG _____

Lab room number where student will work _____

If the student plans to do research in the lab of someone who is not a faculty member of the Department of Microbiology or does not have a courtesy appointment in the Microbiology Department, please provide a short description of the planned research in the space provided below. The proposed studies must focus on some aspect of microbiology research for the student to register for MIBO research credit and will be evaluated by the department's Undergraduate Affairs Committee to see if it meets this criterion.

I have discussed the expectations for the directed research with my faculty research mentor and understand the grading policy for the course. I also understand that I must submit an electronic copy of the final paper to the MIBO department by 5:00 pm THE LAST DAY of class of the semester indicated on the research form to Ms. Kim Brown khbrown@uga.edu

I understand that missing this deadline will lower my grade 25%.

Student's signature _____ ID # _____

Student's full printed name _____

Email address (please print) _____ Phone no _____

Undergraduate Coordinator signature _____ Date _____

Guidelines for Writing your MIBO 4960H/4900L Research Report

A major goal of this course is to effectively communicate your scientific findings in writing. A report that describes your research is due at the end of each semester you perform research in the laboratory. This paper should follow the same format as a scientific manuscript and your advisor should be able to supply you with example works.

Timeline: The following schedule is strongly recommended.

Week 10. Begin an outline containing the following headers:

- Title
- Abstract
- Introduction
- Experimental Methods
- Results
- Discussion
- References
- Tables
- Figures with Figure Legends

Begin writing the Introduction (2-3 pages; 5 references, minimum)

Week 11. Discuss your hypothesis and tentative titles with your advisor
Create Tables, Figures, and write Figure Legends
Write Methods section

Week 12. Write your results section
Share your current draft with your advisor

Week 13. Write Summary (300 word limit) and Discussion section (1-2 pages)
and discuss these sections with your advisor
Revise paper per comments by advisor and/or readers

Week 14. Share revised version with readers and advisor
Revise accordingly

Week 15. Produce final version in .doc or .pdf format
Submit electronic version of your paper by 5:00 pm on the LAST DAY OF CLASS of the semester indicated on the research form to:
Ms. Kim Brown <khbrown@uga.edu>
If a student does not meet this deadline, their grade will be lowered by 25%.

See next page for Detailed Instructions for Specific Sections.

Detailed Instructions for Specific Sections

Title and Cover Page – Create a few informative and descriptive titles. A good title can convey the take home message. Select the most appropriate title with advice from your advisor. Include the name(s) of all the contributing authors and the site/department where the work was done. The Cover page should include the following:

- Title of Project
- Name
- Department Where Work Was Performed
- Course
- Instructor
- Date

Abstract – Provide a concise description (less than 300 words) of your research project and findings. Define the scientific problem or hypothesis, principal objective, methodology, results, and conclusions of your study. This section should be clear enough to be readily understood by a general reader with some scientific background. Although this section is first, it is always best to write this section last when your ideas for the rest of the paper have crystallized.

Introduction – The introduction is meant to familiarize the reader with the scientific area you are studying. Provide a review of the most relevant literature. The paragraphs should flow from general to specific in terms of importance to your project. Many people begin by describing their model system and its advantages over others. This approach should provide a foundation for describing the overall importance of the specific problem you are addressing. In the final paragraph, state your hypothesis(es) and/or objective(s), and describe the reasoning behind them. Many people end by stating their major, overarching conclusion.

Experimental Methods – Concisely describe all of the methods used in your study so that another individual could potentially repeat and verify your observations. This section should not be a step-by-step instruction manual unless you have developed a completely new and complex method. Include the names of specialized chemicals, biological materials, and/or other equipment or supplies not typically used by laboratories. Do not include general laboratory supplies and/or equipment. If your project involved the use of buffers and/or solutions, include the final concentrations of all ingredients and final pH (applicable to buffered solutions). If a published procedure was used as a method, provide a brief general description along with a reference to the original procedure. Determining what to include or exclude may not be easy without experience. A good rule of thumb is to ask your peers if they've heard of a particular method. If so, you can consider not including detailed descriptions of these methods (i.e. SDS-PAGE, agarose gel electrophoresis, PCR, etc.)

Results – Provide an objective view of your results and reserve all data interpretation for the discussion. Refer to figures and tables in numerical order. Use the text to point the reader to the most relevant observations and their essential controls. You may also include results of control experiments and observations that are not presented as part of a formal figure or table. Mark your figures or their legends with appropriate identifying labels for each symbol or abbreviation that was used. Improperly labeled figures are impossible to evaluate. All figures and tables should be placed at the end of the report. The minimum page limit for the report does not include Figures and Tables.

Discussion – Interpret your findings as they support (or contest) your hypothesis(es) and objective(s). Do not simply restate your results. If you believe that your results are supportive, describe your rationale for this conclusion and describe follow-up experiments that may be necessary. If your results contest your hypothesis, explain possible alternative hypotheses and how you might go about experimentally testing your new hypothesis(es). If your results are inconclusive, describe alternative methodologies that could be

used to come to a final conclusion regarding your hypotheses. Keeping in mind that one study will not necessarily answer an overall question, where does your study lead you next? What questions remain? Be creative, and don't be afraid to speculate.

References – Cite articles that the advisor provides or that you find for yourself that are relevant to your study. Different journals use different formats but for the sake of simplicity, use the “author, date” format, and list referenced articles in alphabetical order at the end of the report. Use only primary literature (original research articles authored by the original investigators) and/or reviews. Do not use a web site or Wikipedia page as a reference! We strongly recommend the use of bibliography software such as EndNote. The UGA library has a site license for EndNote so that it is free to install and use.

Figures and Tables – Figures must be numbered consecutively in the order they appear in the text. Do not use raw data as your figures. Graphs should be prepared in a program such as Excel. Figures must contain a figure legend that briefly describes the method(s) used to generate the data. The X and Y axes must be clearly labeled in terms of what was measured and the units used. Unless there is a compelling reason otherwise, for example a logarithmic scale, graphs should begin at zero. When called for, measurements should be made in at least triplicate and have bars indicating standard deviations or another statistical assessment. Tables should have clear and descriptive headers. If the table is complicated, a table legend may be used to describe and define specific features. Photographs of cells should have a scale marker embedded in the image and include a legend that describes the size of the marker, if it is not embedded in the picture. If the figure includes aligned DNA sequences the use of Courier font is recommended since each letter has an identical width, unlike most other fonts.

General Formatting Considerations - Follow the specifications described below:

- a. Font – 12 point Arial, Helvetica, Times, or Times New Roman
- b. Length – 8 pages, double-spaced (not including figures, tables, reference list, or cover page)
- c. Margins – 1 inch (top, bottom, and sides)
- d. Page #s – top right or anywhere on the bottom
- e. Page Breaks – do not use page breaks between sections!
- f. A Header with your name on all pages is highly recommended.